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Haskin

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(54) **PROCESS FOR IMPRINTING A COMPOSITE VENTILATED RIB**

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F41A 21/00 (2006.01)

(52) **U.S. Cl.** **42/112; 42/76.1; 89/16**

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See application file for complete search history.

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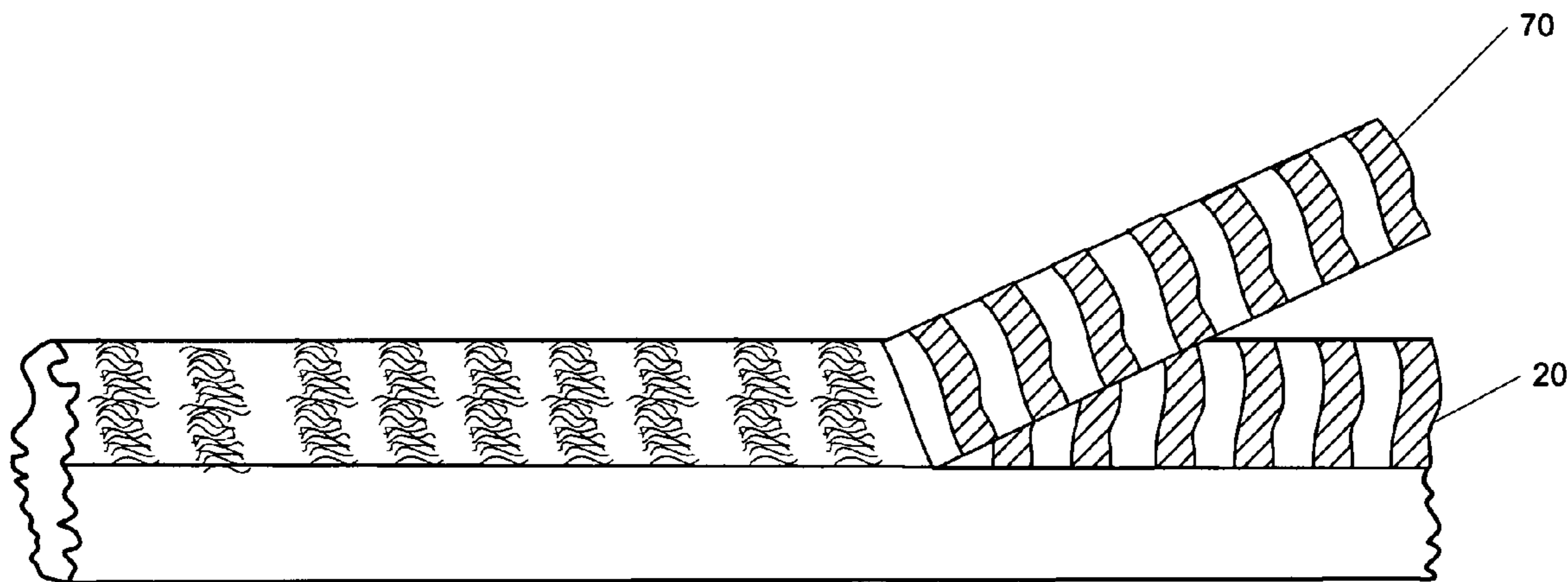
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(57) **ABSTRACT**

A method of forming a composite rib for the barrel of a firearm is provided. The method generally includes aligning composite material and a release layer and directing the combination of materials through a die. The release layer is removed from the intermediate rib leaving a three-dimensional finish formed in the surface of the rib.

17 Claims, 3 Drawing Sheets



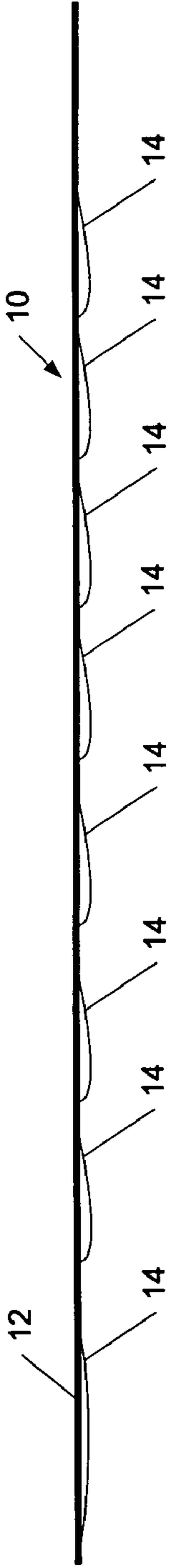


FIG. 1

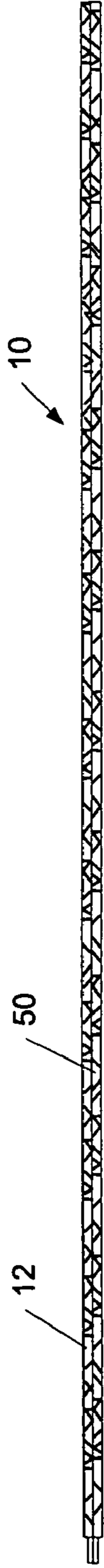


FIG. 2

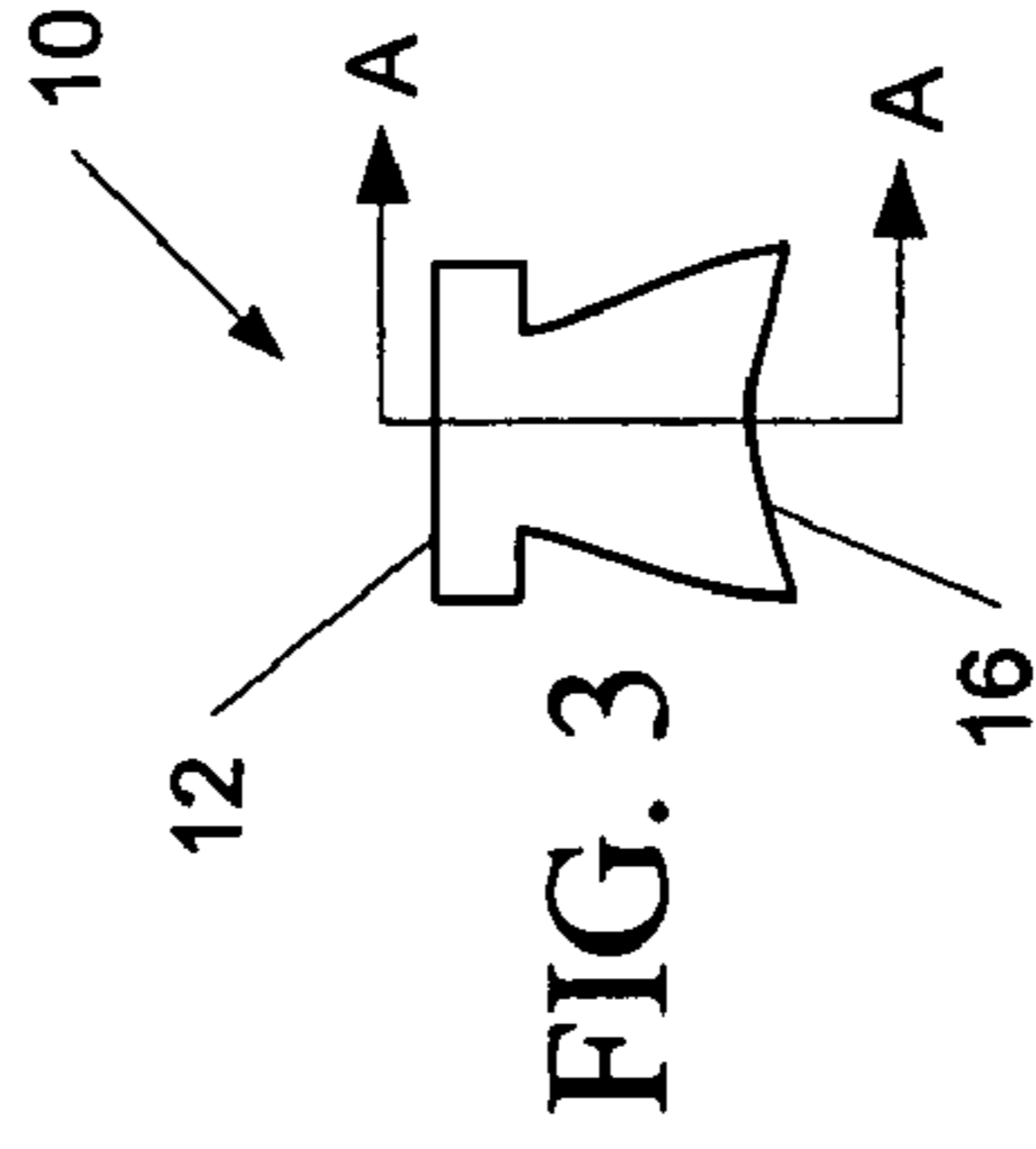


FIG. 3

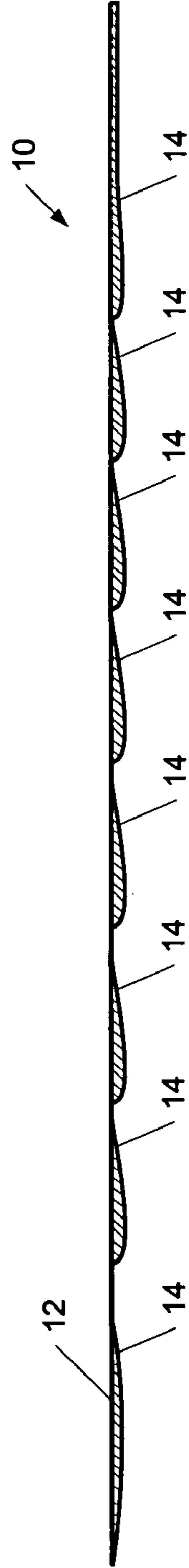


FIG. 4

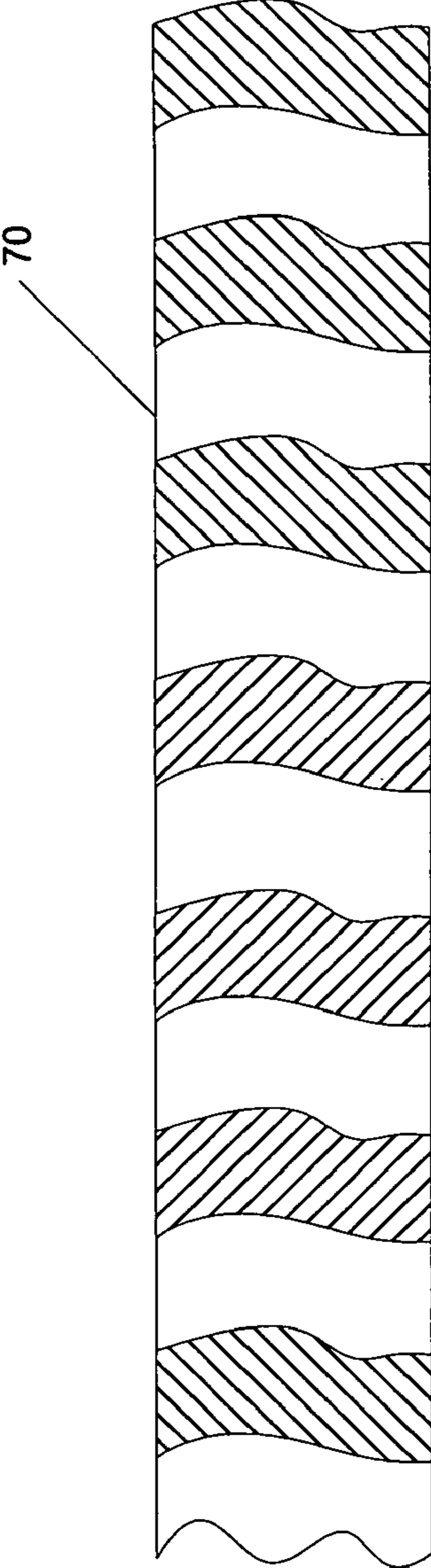


FIG. 5

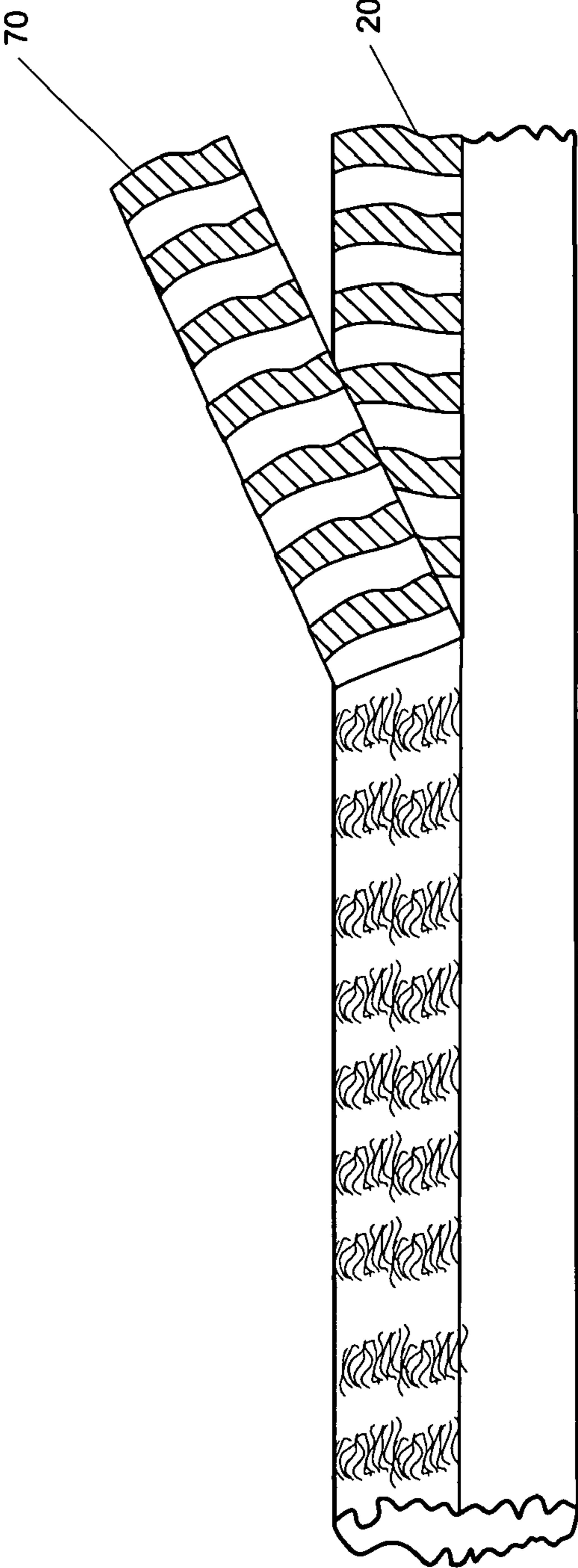


FIG. 6

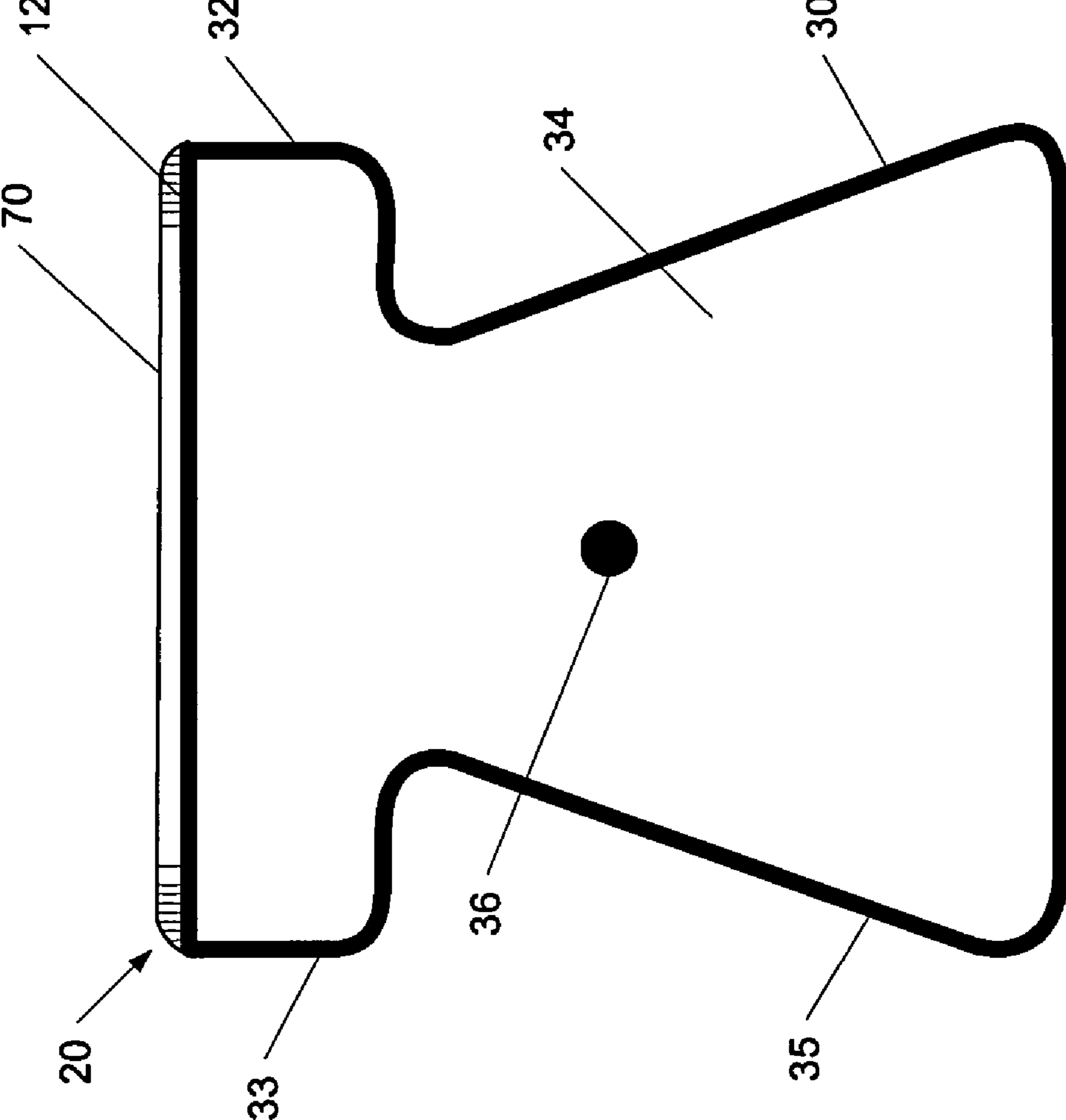


FIG. 7

PROCESS FOR IMPRINTING A COMPOSITE VENTILATED RIB

CROSS-REFERENCE TO RELATED APPLICATION

The present application claims priority to the filing date of U.S. Provisional Application Ser. No. 60/501,685, filed on Sep. 10, 2003 and which is incorporated by reference as if set forth herein in its entirety.

TECHNICAL FIELD

The present invention generally relates to composite pultrusions and in particular, to imprinting a composite ventilated rib for firearms.

BACKGROUND

Firearms, such as pistols and rifles, typically include a ventilated rib mounted on the barrel. Finishing of the outer surface of the ventilated rib is conventionally carried out by machining the rib. Machining the surface of the rib generally is acceptable for ventilated ribs made from metals, such as steel or aluminum. However, when the ventilated rib is formed of a composite material containing reinforcing fibers, machining the outer surface of the rib can remove resin and expose fibers at the rib's surface. Nonetheless, finishing of particularly the top surface of the rib is necessary to prevent light from reflecting across the top surface, which could impair the shooter's view of the sight and target.

Consequently, there is a need for a method for finishing or imprinting the surface of a composite ventilated rib.

SUMMARY

Briefly described, the present invention generally is directed to a method for forming a composite rib for a firearm such as a pistol, rifle or other long gun and imparting a three-dimensional finish to the surface of such a composite firearm rib.

In one aspect of the present invention, a method of forming a composite rib for a firearm is provided in which a release layer is aligned with a composite material, after which the release layer and composite material are protruded or extruded through a die to form a composite intermediate rib. The method also includes removing the release layer from the surface of the intermediate rib to which it has been applied, leaving a three-dimensional finish formed in the surface of the intermediate rib. Thereafter, the intermediate rib will be cut or trimmed to a predetermined length to form a rib for mounting to a barrel of a firearm.

In another aspect of the present invention, the method of forming a component of a firearm can comprise extruding or pultruding a combination of the release layer and the composite material through a die to form an intermediate part, and thereafter separating the release layer from a surface of the intermediate part leaving a finish formed in the surface. The method also includes reducing the intermediate part to a predetermined size to fit a firearm.

As a further alternative, the rib could be formed with the formation of a composite barrel or barrel section as an integral part thereof.

These and other aspects of the disclosure are set forth in greater detail in the detailed description below and the drawings, which are briefly described as follows.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a side view of a ventilated rib for a firearm made according to a method that includes aspects of the present invention.

FIG. 2 is a top view of the ventilated rib of FIG. 1.

FIG. 3 is a front end view of the ventilated rib of FIG. 1.

FIG. 4 is a cross-sectional view of the rib of FIG. 1 taken along line A—A.

FIG. 5 is a top view of a portion of a release layer usable in a method that includes aspects of the present invention.

FIG. 6 is a perspective view of an intermediate rib and the release layer of FIG. 5.

FIG. 7 is a cross-sectional view a combination of a rib and release layer usable in a method that includes aspects of the present invention.

DETAILED DESCRIPTION

Referring now to the drawings in which like reference numerals indicate like parts throughout the several views, FIGS. 1–7 illustrate features that are used in or produced by the methods of the present invention, which generally comprises methods of finishing one or more surfaces of a composite rib **10** for the barrel of a firearm, such as a pistol, rifle, shotgun or other long guns. The composite rib **10**, which is shown as a ventilated rib in FIGS. 1 and 2, but which also can be unventilated or solid, includes a finish **50** formed or imprinted along one or more exterior surfaces, illustrated as the top surface **12** for purposes of illustration. The finish **50** can be a weave pattern to create a matte finish or any other pattern desirable, such as lettering, designs, shapes or other indicia.

The design generally is created by a release layer **70**, which can be in the form of a strip or a ribbon and which has the desired finish or pattern imprinted or formed therein. The release layer **70** imparts the finish **50** to the composite rib **10** when the release layer **70** and the composite material used to form the composite rib **10** are directed through a die to form an intermediate rib **20**. After pultrusion through the die, the release layer **70** can be removed from the intermediate rib **20** leaving the finish design formed in the top surface **12** thereof. The intermediate rib **20** can be machined, reduced and further processed or finished to form the composite rib **10** having the finish **50** formed thereon. The strength of the composite generally is not affected by the release layer and/or its removal from the rib, nor are there changes to design, size and placement of the reinforcing fibers within the composite rib from removal of the release layer, which leaves a surface finish **50** imprinted on the rib.

The ventilated rib **10** generally is manufactured using a continuous pultrusion process and can be formed as a separate, individual component, as illustrated in the drawings and discussed below. It will also be understood that the rib can be formed as an integral part or component of a composite barrel, such as disclosed in U.S. patent application Ser. No. 10/920,929 filed Aug. 18, 2004, which is incorporated herein by reference.

The rib **10** generally is formed of a composite material that includes one or more reinforcing fibers and a resin. The reinforcing fibers can be selected from glass, carbon, or polymeric fibers which can impart strength to the rib. For example, the reinforcing fibers can include glass fibers having 250 roving and 32 ends produced by Owens/Corning, and carbon fibers having 250 yield roving and one end. The reinforcing fibers generally are distributed in a resin matrix. The resin can include any conventional resin typi-

cally used in making composite materials. For example, the resin can be a vinyl ester, such as Interplastic 8182 or Hetron LB6875 from Ashland Chemical. The composite material has a glass content of about 60% to about 65% by weight and a resin content of about 35% to about 40% by weight. The density of the composite can be in a range of about 0.065 to about 0.075 pounds per cubic inch.

One or more surface veils **32** and **33** generally are applied to the composite material to form a boundary layer **35** that provides and aesthetically appealing surface to the composite component. The boundary layer can be about 11 mils thick and typically is black, although other colors and thicknesses are contemplated.

The release layer **70** can have a grosgrain black finish and be about 0.31 inches wide with sizing. For example, the release layer **70** can be a #674 Special Ribbon from American Ribbon.

The method generally includes providing a composite material, such as the material shown in FIG. 7 that includes glass rovings **34** and carbon rovings **36** orientated such that the carbon roving **36** is embedded in the glass rovings **34** and generally aligned in a parallel direction. The glass and carbon rovings **34** and **36** are "wet-out" in a bath of thermoset resin, such as polyester or vinyl ester. The surfacing veils **33** and **32** are aligned around the rovings **34** and **36** to form a boundary layer **35**, while the release layer **70** generally is aligned adjacent the boundary layer **35**. The combination of the release layer **70**, boundary layer **35**, resin and rovings **34** and **36** then are fed through the die of a pultrusion system or mechanism and is heated to about 225–320° F., for example 280° F. The cured resin is then pulled at 6 to 28 inches per minute (although other, lesser or greater rates also can be used as desired and depending on the materials used) through the die with either hydraulic or caterpillar style pullers to form an intermediate rib or component **20**. The intermediate rib **20** typically then is cut to length and the release layer **70** is removed. Once the release layer **70** is removed, the matting pattern remains permanently formed on the rib. The intermediate rib **20** is machined to form the ventilations **14** and the barrel seat radius **16** to form the composite rib for use on the barrel of a firearm.

The method also can include forming the release layer **70** to impart the finish or pattern therein. For example, where the release layer **70** is a ribbon form from woven fibers. The method can include the step of weaving of the release layer. In one example, the release layer **70** is woven in a grosgrain pattern which gives the desired cosmetic effect to the top surface **12** of the composite rib **10**. After imparting the pattern in the release layer **70**, the layer can be sized by impregnating it with sizing agents, such as starch. The sizing is necessary to prevent the resin of the composite from "wetting-out" the release layer **70**. The release layer **70** is sized when the components of the layer are of the type that could absorb the resin, such as, for example, cellulosic materials, such as cotton, wool, and rayon. The sizing prevents the resin from absorbing into the release layer **70**, thereby allowing the layer to be removed easily from the top **12** of the intermediate rib **20**. The texture, thickness and pattern of the ribbon are used to determine the matting pattern which remains. Other materials besides cellulosic materials can be used to form the release layer **70**. For example, mylar, polyester, nylon, and aramid materials or fibers can be included in the release layer. The pattern, texture, thickness and or text further may be altered to leave various corresponding patterns or designs on the resultant pultrusion.

The patterns formed using the present invention generally are only limited by the capability of the ribbon weaving process applied to the thin sheet which is then placed over the bonded surface. The depth and width of the ribs in the cross grain weave are almost infinitely variable, insofar as the weaver is concerned. This flexibility can allow a protruded surface to be cosmetically altered with either a pattern or text.

In addition to thin sheets, further materials can be introduced which can be molded or produced in a variety of shapes, patterns or text and then inserted into a protruded component and then removed to leave the shape of the insert in the protruded part.

The present process eliminates the need to perform secondary machining operations which may be required to place insignia or designs on the gun barrel. The process provides the ability to add text to the protrusion that would otherwise have to be added to the surface of the secondary process.

It is to be understood that the above examples of are provided for illustration and are not to be construed to limit the scope of the disclosure. The disclosure encompasses modifications and alterations made by those of ordinary skill in the art to the disclosed examples.

What is claimed is:

1. A method of finishing a rib for a firearm comprising: aligning a release layer in a desired orientation with a composite material; pultruding the release layer and composite material through a die to form a firearm rib; and removing the release layer from a surface of the rib, wherein the rib includes a three-dimensional finish formed in the surface.
2. The method of claim 1 and further comprising cutting the rib to a predetermined length to form a finished rib for mounting to a barrel of the firearm.
3. The method of claim 1, further comprising providing a composite material comprising a reinforcing fiber.
4. The method of claim 3, wherein the composite material comprises a resin.
5. The method of claim 1, wherein aligning the release layer and composite material comprises aligning a boundary layer material between the release layer and the composite material.
6. The method of claim 1, further comprising providing a release layer comprising a material selected from mylar, aramid, cotton, rayon and combinations thereof.
7. The method of claim 1, further comprising providing a release layer comprising a cellulosic material and sizing material.
8. The method of claim 1, further comprising providing a release layer having a pattern or indicia formed therein.
9. The method of claim 1, further comprising machining the rib.
10. A method of forming a component of a firearm comprising: directing a combination of a release layer and a composite material through a die to form an intermediate part; separating the release layer from a surface of the intermediate part, wherein the surface of the intermediate part has a finish formed therein; and, finishing the intermediate part to form the component of a predetermined size for the firearm.

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11. The method of claim 10, wherein directing a combination of a release layer and a composite material through a die comprises pultruding the combination.

12. The method of claim 10, further comprising providing a composite material comprising a reinforcing fiber.

13. The method of claim 12, wherein the composite material comprises a resin.

14. The method of claim 10, further comprising providing a boundary layer between the release layer and the composite material.

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15. The method of claim 10, further comprising providing a release layer comprising a material selected from mylar, aramid, cotton, rayon and combinations thereof.

5 16. The method of claim 10, further comprising providing a release layer comprising a cellulosic material and sizing material.

17. The method of claim 10, further comprising providing a release layer having a pattern or indicia formed therein.

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